Modified Abstract Exemplars

Biological Science:

"The *Listeria monocytogenes* p60 protein is not essential for viability *in vitro*, but promotes virulence *in vivo*"

Intracellular pathogens, such as *Mycobacterium tuberculosis* and *Listeria monocytogenes*, cause high mortality rates in the United States. Deciphering the mechanisms through which the pathogens cause disease is of great interest. *Listeria* infection of mice is a well-developed model system for studying the fundamentals of host-pathogen interactions. *In vitro* assays in animal cell cultures have helped show that *Listeria* causes illness by secreting virulence factor molecules, such as p60, to affect the host. P60 is an antigen implicated in regulated bacterial cell wall breakdown. This study examined: 1) Is p60 essential to the viability of *Listeria*, as previously published?, and 2) Is p60 a virulence factor in *Listeria*? To address these questions, I constructed a *Listeria* strain lacking p60. This new strain displayed no defect in viability. In fact, most standard in vitro pathogenicity assays were normal. However, when the new strain was tested in a mouse, a 1000-fold reduction in virulence was observed. This discovery suggests that p60 is indeed a key factor in the disease-causing ability of *Listeria*, but not essential for viability. Future studies will focus on the precise role of p60 in *Listeria* pathogenesis. This work increases our understanding of such diseases as tuberculosis, various food poisonings, and meningitis.

[202 words]

Engineering:

"Quantifying the mechanics of a laryngoscopy"

Laryngoscopy is a medical procedure that provides a secure airway by passing a breathing tube through the mouth and into the lungs of a patient. The ability to successfully perform laryngoscopy is highly dependent on operator skill. Experienced physicians have failure rates of 0.1% or less. Less experienced medics may have failure rates of 10-33%, which can lead to death or brain injury. Accordingly, there is a need for improved training methods, and virtual reality technology holds promise for this application. The objective of this research project is to measure the mechanics of laryngoscopy, so that an advanced training mannequin can be developed. An instrumented laryngoscope has been developed which uses a 6-axis force/torque sensor and a magnetic position/orientation sensor to quantify the interactions between the laryngoscope and the patient. Experienced physicians and residents in-training used this device on an existing mannequin, and the force and motion trajectories have been visualized in 3D. Comparisons between expert and novice users identified the critical skill components necessary for good patient outcomes, the mechanical properties human anatomy that affects laryngoscopy, and development pathways for a realistic training simulator. In the future an advanced training mannequin will be developed whose physical properties will be based on these measurements and virtual reality tools will be used to provide training feedback for novice users.

[218 words]